

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims

1. (Previously presented) A CPP giant magnetoresistive head comprising:
lower and upper shield layers with a predetermined shield distance therebetween; and
a giant magnetoresistive element disposed between the upper and lower shield layers and comprising a pinned magnetic layer, a free magnetic layer, and a nonmagnetic layer disposed between the pinned magnetic layer and the free magnetic layer, a current flowing perpendicularly to a film plane of the giant magnetoresistive element;
wherein a lower large-area nonmagnetic metal film is provided directly above the lower shield layer and an upper large-area nonmagnetic film is provided directly below the upper shield layer to make direct contact with the pinned magnetic layer and the free magnetic layer, respectively, of the giant magnetoresistive element, and the lower and upper large-area nonmagnetic metal films have larger areas than those of the pinned magnetic layer and the free magnetic layer, respectively.
2. (Original) The CPP giant magnetoresistive head according to claim 1, wherein each of the lower and upper large-area nonmagnetic metal films is formed to a thickness of 1/4 or more of the shield distance, and the giant magnetoresistive element is formed to a thickness of 3/4 or less of the shield distance.
3. (Original) The CPP giant magnetoresistive head according to claim 2, wherein the thickness of the lower and upper large-area nonmagnetic metal films is 60 Å to 300 Å.
4. (Previously presented) The CPP giant magnetoresistive head according to claim 1, wherein a nonmagnetic metallic material used for forming the large-area nonmagnetic metal films contains at least one element of Au, Ag, Cu, Ru, Rh, Ir, Pd, Ni-

Cr, (Ni-Fe)-Cr, and Cr, and when the nonmagnetic metallic material contains Cr, the Cr content exceeds 20 atomic percent.

5. (Original) The CPP giant magnetoresistive head according to claim 4, wherein a nonmagnetic metallic material for forming the large-area nonmagnetic metal film formed directly above the lower shield layer comprises Ta/Cu, Ta/Ru/Cu, Ta/Cr, Ta/Ni-Cr, Ta/(Ni-Fe)-Cr, or Cr, and when the nonmagnetic metallic material contains Cr, the Cr content exceeds 20 atomic percent.

6. (Previously presented) The CPP giant magnetoresistive head according to claim 1, wherein the pinned magnetic layer extends to a rear of the free magnetic layer and the nonmagnetic layer in a height direction, and a dimension of the pinned magnetic layer in the height direction is larger than that in a track width dimension.

7. (Previously presented) The CPP giant magnetoresistive head according to claim 1, further comprising an antiferromagnetic layer provided in a rear of the pinned magnetic layer in a height direction, for pinning a magnetization direction of the pinned magnetic layer.

8. (Previously presented) The CPP giant magnetoresistive head according to claim 1, wherein the pinned magnetic layer extends in a track width direction beyond the free magnetic layer and the nonmagnetic layer, and the giant magnetoresistive element further comprises antiferromagnetic layers provided on both sides of the pinned magnetic layer in the track width direction, for pinning a magnetization direction of the pinned magnetic layer.

9. (Previously presented) The CPP giant magnetoresistive head according to claim 1, wherein the pinned magnetic layer has a laminated ferrimagnetic structure comprising a first pinned magnetic layer, a nonmagnetic intermediate layer, and a second pinned magnetic layer, the first pinned magnetic layer extends in a track width direction, and the giant magnetoresistive element further comprises antiferromagnetic layers provided on both sides of the first pinned magnetic layer in the track width direction, for pinning a magnetization direction of the first pinned magnetic layer.

10. (Previously presented) The CPP giant magnetoresistive head according to claim 1, wherein the giant magnetoresistive element does not include an antiferromagnetic layer, the pinned magnetic layer comprises a magnetic material having a positive magnetostriction constant or a magnetic material having high coercive force, and the pinned magnetic layer is exposed at a surface facing a recording medium.

11. (Original) The CPP giant magnetoresistive head according to claim 9, wherein part or entirety of the second pinned magnetic layer comprises Fe-Co-Cu (wherein Fe > 10 atomic percent, Co > 30 atomic percent, and Cu > 5 atomic percent), Fe-Co-Cu-X (wherein X is at least one element of Pt, Pd, Mn, Si, Au, and Ag), or Co₂MnY (wherein Y is at least one element of Ge, Si, Sn, and Al).

12. (Original) The CPP giant magnetoresistive head according to claim 1, wherein part or entirety of the free magnetic layer comprises Fe-Co-Cu (wherein Fe > 10 atomic percent, Co > 30 atomic percent, and Cu > 5 atomic percent), Fe-Co-Cu-X (wherein X is at least one element of Pt, Pd, Mn, Si, Au, and Ag), or Co₂MnY (wherein Y is at least one element of Ge, Si, Sn, and Al).

13. (Previously presented) The CPP giant magnetoresistive head according to claim 1, further comprising hard bias layers provided on both sides of the giant magnetoresistive element and between the large-area nonmagnetic metal films, and an insulating layer filling in each space between the hard bias layers and the large-area nonmagnetic metal films.